

CLAIMS

1. A high pressure fuel supply pump having a pressurizing chamber for pressurizing fuel supplied from an intake passage of fuel by a pressuring member to feed it under pressure to a discharge passage characterized in that:

in addition to a main pressurizing chamber in which said pressurizing member is arranged, a sub-pressurizing chamber for communicating said intake passage with said discharge passage is provided.

2. The high pressure fuel supply pump according to claim 1, characterized in that said intake passage and said discharge passage are communicated with an upper end portion of said pressurizing chamber.

3. The high pressure fuel supply pump according to claim 1, characterized in that:

wherein said sub-pressurizing chamber is arranged substantially annularly on the outer circumference of said main pressurizing chamber.

4. A high pressure fuel supply pump having a pressurizing chamber for pressurizing fuel supplied from an intake passage of fuel by a pressuring member to feed it under pressure to a discharge passage characterized in that it comprises:

a pressurizing chamber forming member having a

tapered surface at an end and formed from a member separately from a pump body, and said tapered surface of said pressurizing chamber forming member is compression-fitted by a fixing member to thereby form said pressurizing chamber.

5. A high pressure fuel supply pump having a pressurizing chamber communicated with an intake passage of fuel and a discharge passage, and a pressurizing member for feeding under pressure fuel within the pressurizing chamber to said discharge passage, characterized in that it comprises:

a seal material arranged in a sliding portion of said pressurizing member;

a connecting passage for communicating a fuel passage side of the seal material with a fuel intake passage; and

a check valve arranged in the connecting passage to prevent fuel from entering from said fuel intake passage side to said seal material side.

6. The high pressure fuel supply pump according to claim 1, characterized in that:

said check valve is open when a pump stops its operation.

7. The high pressure fuel supply pump according to claim 2, characterized in that said check valve is formed from an elastic member.

8. A high pressure fuel supply pump for an internal combustion engine, comprising:

a valve body for opening and closing a through hole for communicating a low pressure side fuel passage with a cylinder of a pump;

a spring element which exerts on the valve body to bias it in a direction in which said valve body closes said through hole;

an engaging member engaged with or moved away from said valve body to assist opening and closing of said valve body; and

an electromagnetic driving device for electromagnetically driving said engaging member in association with the operating state of the internal combustion engine.

9. A high pressure fuel supply pump for an internal combustion engine, comprising:

an electromagnetic operating mechanism controlled by a signal from a control unit of the internal combustion engine;

an engaging member provided in said electromagnetic operating mechanism to take an advanced first position and a withdrawn second position by a control signal from said control unit;

a valve body for opening and closing a fuel introducing port for communicating a cylinder of a pump

with a low pressure side fuel passage; and

a spring for biasing said valve body in a direction in which said fuel introducing port closes;

said high pressure fuel supply pump for an internal combustion engine configured as that when said engaging member is at the first position, said valve body is held at the position at which said fuel introducing port is opened; and

when said engaging member is at the second position, said valve body is opened and closed due to a pressure difference between upstream and downstream of said valve body.

10. The high pressure fuel supply pump for an internal combustion engine according to claim 9, wherein when fuel pressure in said pump cylinder exceeds a predetermined value after said valve body has been closed, said valve body prevents said engaging member from changing to the first position.

11. A high pressure fuel supply pump for an internal combustion engine, comprising:

a cylinder;

a plunger which reciprocates within said cylinder to change the volume within the cylinder;

a valve body provided, in order to open and close a through hole for connecting the interior of the cylinder with a low pressure fuel passage, on the downstream side of

said through hole;

a first spring for biasing the valve body in a closing direction;

an engaging member installed on the side of said low pressure fuel passage to operate said valve body to an opening position against force of said first spring;

a second spring for imparting said engaging member resisting force to the force of said first spring; and

an electromagnetic driving device for releasing said engaging member from the state engaged with said valve body against the force of said second spring.

12. The high pressure fuel supply pump for an internal combustion engine according to claim 11, wherein said through hole is a fuel intake hole.

13. The high pressure fuel supply pump for an internal combustion engine according to claim 11, wherein said through hole is a fuel spill (overflow) hole.

14. The high pressure fuel supply pump for an internal combustion engine according to claim 11, wherein operating timing of said electromagnetic driving device is selected as fixed timing during compression operation of said plunger within said cylinder.

15. The high pressure fuel supply pump for an internal combustion engine according to any according to claims 8, 9 and 11;

wherein said engaging member has an elongated rod;

and

a ball member is mounted on the end on said valve body side of said rod portion.

16. The high pressure fuel supply pump for an internal combustion engine according to claim 15;

wherein said ball member is formed of a material having hardness equal to or more than  $H_{RC} 30$  in Rockwell hardness scale.

17. The high pressure fuel supply pump for an internal combustion engine according to claim 15, wherein said ball member is formed of stainless steel SUS440C in accordance with JIS Standard.

18. The high pressure fuel supply pump for an internal combustion engine according to any of claims 8, 9 and 11, wherein said valve body is formed of a material having hardness more than  $H_{RC} 30$  in Rockwell hardness scale.

19. The high pressure fuel supply pump for an internal combustion engine according to any of claims 8, 9 and 11, wherein said valve body is formed of stainless steel SUS440C in accordance with JIS Standard.

20. The high pressure fuel supply pump for an internal combustion engine according to claim 15, wherein said rod portion is formed of a magnetic material.

21. The high pressure fuel supply pump for an internal combustion engine according to claim 15, wherein said rod portion is formed of magnetic stainless steel

SUS420J2 in accordance with JIS Standard.

22. The high pressure fuel supply pump for an internal combustion engine according to any of claims 8, 9 and 11, wherein a member formed with said through hole is formed of stainless steel SUS440C in accordance with JIS Standard.

23. The high pressure fuel supply pump for an internal combustion engine according to claim 15, wherein said valve body and said ball member are formed of stainless steel SUS440C in accordance with JIS Standard, and said rod portion is formed of magnetic stainless steel SUS420J2 in accordance with JIS Standard.

24. A high pressure fuel supply pump, comprising:  
a valve member provided in a fuel passage leading to a cylinder for receiving fuel;

a spring for imparting force for closing or opening said fuel passage to said valve member;

a valve operating member for pushing or pulling said valve body in a direction along the axis of a component of said spring to change said valve member to an opening position or a closed position; and

an electromagnetic mechanism for operating said valve operating member and said valve member to a separated state and/or an engaged state so as to operate said valve member to the opening position or the closed position through said valve operating member.

25. A high pressure fuel supply pump, comprising:  
an intake check valve provided in a fuel inlet  
portion of a cylinder;

an operating member which comes in contact with said  
intake check valve to forcibly operate it to the opening  
position; and

an electromagnetic mechanism for pulling said  
operating member away from said intake check valve to move  
said intake check valve to a non-contact position.

26. A high pressure fuel supply pump comprising an  
electromagnetic mechanism having a plunger biased to a  
jump-out position by a spring, and an electromagnetic  
solenoid for operating said plunger to a withdrawn position,  
and

an intake check valve provided in a fuel inlet of a  
pump, said electromagnetic mechanism being mounted integral  
with the pump body so that when said plunger is at the  
jump-out position, it comes in contact with said check  
valve to operate said check valve to an opening position,  
and when at the withdrawn position, it moves away from said  
check valve to operate said check valve to a closed  
position.

27. A high pressure fuel supply pump, comprising:  
a valve body loaded with spring so that a fuel  
introducing port of a cylinder is closed from the  
compression chamber side of the cylinder; and



an opening and closing operating mechanism which is moved away from the valve body in the stroke in which said valve body closes said fuel introducing port, and said high pressure fuel supply pump comes in contact with the valve body in the stroke in which said valve body is opened imparting force opposite to said spring force thereto.

28. A high pressure fuel supply pump having a pressurizing chamber communicated with an intake passage of fuel and a discharge passage, a piston for feeding fuel under pressure in said pressurizing chamber to said discharge passage, and an intake valve provided within said intake passage, wherein when pressure at downstream of said intake valve is equal to or higher than pressure upstream thereof, a valve closing force is generated in said intake valve, said supply pump comprising an engaging member applied with a first biasing force so as to oppose when said intake valve moves in a closing direction, and an actuator for exerting a second biasing force opposite to said first biasing force to the engaging member by an external input, in which when said first biasing force is set off by said second biasing force, said engaging member is pulled away from said intake valve.

29. The high pressure fuel supply pump according to claim 28, wherein resultant force of the closing force of the intake valve generated when pressures at upstream and downstream of said intake valve are equal to each other and

the second biasing force by said actuator is made higher than said first biasing force.

30. The high pressure fuel supply pump according to claim 28, wherein said actuator generates the second biasing force by electromagnetic force.

31. The high pressure fuel supply pump according to claim 28, wherein an engaging portion between said intake valve and said engaging member is in the form of a concavo-convex engagement.

32. A high pressure fuel supply pump having a pressurizing chamber communicated with an intake passage of fuel and a discharge passage, a pressurizing member for feeding fuel under pressure in said pressurizing chamber to said discharge passage, and a check valve for controlling a flowing direction of fuel with respect to at least one pressurizing chamber in said intake passage or said discharge passage, characterized in that a spherical valve body is provided at at least one part of said check valve, and a substantially cylindrical member is placed in contact with said spherical valve body to slidably support said cylindrical member on the inner wall of passage.

33. A high pressure fuel supply pump having a pressurizing chamber communicated with an intake passage of fuel and a discharge passage, a cylindrical member forming a part of said pressurizing chamber and having a sliding hole for supporting a plunger type piston to allow

reciprocation and slidable movement, and a pump body for holding said cylindrical member to form a part of said pressurizing chamber, characterized in that said cylindrical member has a large diameter portion enlarged in inner wall at one end of the sliding hole, and is held on the pump body at an outer wall of said enlarged inner wall.

34. The high pressure fuel supply pump according to claim 33, characterized in that substantially annular passages communicating with one end opposite to the pressurizing chamber of the sliding hole are provided externally on both sliding hole of said cylindrical member and said enlarged inner wall, said annular passage is enabled to communicate with a fuel introducing passage.

35. A high pressure fuel supply pump for an internal combustion engine, comprising:

an electromagnetic driving mechanism provided with a holder in which an intake valve mechanism is accommodated in an intake passage portion communicated with a pressurizing chamber and having a plunger rod which moves forward and backward along the same axis as said intake valve and a movable core mounted thereon, wherein an intake opening opened and closed by said intake valve is formed at a part in contact with said holder of said electromagnetic driving mechanism.